

引用本文(Citation):

郭九苓, 沈超, 刘振兴. 模拟IMF北向且 $B_y$ 分量占主导时磁层顶重联. 地球物理学报, 2013, 56(4): 1065-1069, doi: 10.6038/cjg20130401

GUO Jiu-Ling, SHEN Chao, LIU Zhen-Xing. Simulation of magnetic reconnection on the magnetopause with northward IMF and a substantial  $B_y$  component. Chinese Journal Geophysics, 2013, 56(4): 1065-1069, doi: 10.6038/cjg20130401

## 模拟IMF北向且 $B_y$ 分量占主导时磁层顶重联

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Simulation of magnetic reconnection on the magnetopause with northward IMF and a substantial  $B_y$  component

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摘要

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### 摘要

本文基于自己开发的全球三维磁层模型, 模拟研究了IMF(Interplanetary Magnetic Field)北向并且 $B_y$ 分量较大(时角为 $60^\circ$ )时磁层顶三维结构及其重联图像. 结果发现, IMF  $B_y$ 为正时, 在北极隙区附近尾-昏侧存在IMF与地磁场之间稳定持续的重联现象, 参与重联的地球磁场既有闭合磁力线也有开放磁力线; IMF在北极隙区与地球闭合磁力线重联后一端与南磁极相连的磁力线在尾向运动时还可能与北尾瓣的开放磁力线重联而重新闭合, 这种重联与磁力线循环过程不同于同一条IMF磁力线分别在南北半球与地磁场重联的模型. 南北极隙区的重联发生在尾-晨侧, 其动力学过程与北极隙区情形类似. 我们的模拟结果表明, IMF  $B_y$ 较大时不可能发生IMF同一条磁力线分别在南北极隙区重联的情形, 也不会因此而减少尾瓣的开放磁力线.

关键词 磁层顶, 磁重联, 北向IMF, 磁尾, MHD模拟

### Abstract:

We have studied the magnetic reconnection on the magnetopause when IMF has a northward and substantial duskward components based on a newly developed global MHD simulation model. The results suggest there are continuous and quasi-stable merging processes occurred on the magnetopause at tail-duskward of north cusp and tail-dawnward of south cusp respectively. IMF field lines are reconnected with both open lobe field lines and close terrestrial field lines. Near the north (south) cusp, the reconnected field lines with their feet in the south(north) cusp, which formed by the IMF and closed dipolar field lines, can make a second reconnection with the opened north (south) lobe field lines when they are draped tailward. This process of magnetic cycling is quite different with the model that one single IMF line is connected to both north and south lobes. Our results suggest that, double-reconnection between a single IMF line and both north and south lobe field lines cannot happen when IMF has a substantial  $B_y$  component, and thus the opened lobe field lines cannot be decreased by this process.

Keywords Magnetopause, Magnetic reconnection, Northward IMF, Magnetotail, MHD simulation

Received 2011-12-16;

Fund:

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